Study plan

Name of study plan: Medical electronics and bioinformatics

Faculty/Institute/Others: Faculty of Electrical Engineering Department: Branch of study guaranteed by the department: Welcome page Garantor of the study branch: Program of study: Medical Electronics and Bioinformatics Type of study: Follow-up master full-time Required credits: 114 Elective courses credits: 6 Sum of credits in the plan: 120 Note on the plan: Specializace Zpracování signál

Name of the block: Compulsory courses in the program Minimal number of credits of the block: 60 The role of the block: P

Code of the group: 2018_MBIODIP Name of the group: Diploma Thesis Requirement credits in the group: In this group you have to gain 30 credits Requirement courses in the group: In this group you have to complete 1 course Credits in the group: 30 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BDIP30	Diploma Thesis	Z	30	22s	L	Р

Characteristics of the courses of this group of Study Plan: Code=2018_MBIODIP Name=Diploma Thesis

 BDIP30
 Diploma Thesis
 Z
 30

 Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.

Code of the group: 2018_MBIOP

Name of the group: Compulsory subjects of the programme Requirement credits in the group: In this group you have to gain 30 credits Requirement courses in the group: In this group you have to complete 5 courses Credits in the group: 30 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BAM31BSG	Biological signals Roman mejla Roman mejla Roman mejla (Gar.)	Z,ZK	6	2P+2L	L	Ρ
BMPROJ6	Diploma Project Roman mejla, Jan Kybic, Vratislav Fabián, Petr Pošík Petr Pošík Roman mejla (Gar.)	Z	6	0p+6s	Z,L	Ρ
BAM31LET	Medical Instrumentation and Devices Jan Havlík Jan Havlík Jan Havlík (Gar.)	Z,ZK	6	2P+2L	Z	Ρ
B4M36SAN	Statistical Data Analysis Ji í Kléma Ji í Kléma Ji í Kléma (Gar.)	Z,ZK	6	2P+2C	Z	Ρ
BAM33ZSL	Medical Imaging Systems Jan Kybic, Vít Herynek, André Sopczak Jan Kybic Jan Kybic (Gar.)	Z,ZK	6	2P+2C	L	Р

Characteristics of the courses of this group of Study Plan: Code=2018_MBIOP Name=Compulsory subjects of the programme BAM31BSG Biological signals Z.ZK 6

BAM31BSG	Biological signals	Z,ZK	6
BMPROJ6	Diploma Project	Z	6

BAM31LET Me	edical Instrumentation and Devices			Z	Z,ZK	6
Students will study fundamental principles applied within the modern medical devices and systems, esp. from the point of view of functional blocks and electronic circuits of diagnostical						
and therapeutical medical equipments including electrocardiographs, electroencephalographs, bedside and central monitors, equipments for anestesiology, intensive and critical healthere and defibrilators, blood pressure and flow measurement (including dilution) and pulse ovumetry.						
	atistical Data Analysis	e and now measu	rement (inci			6
This course builds on the ski	alistical Data Artarysis	oduction to applie	d statistics	ک It mainly air	_,∠r∖ ns at multivaria	U te statistical
analysis and modelling, i.e., the methods that help to understand, interpret, visualize and model potentially high-dimensional data. It can be seen as a purely statistical counterpart to						
machine learning and data r	nining courses.				,	
BAM33ZSL Me	edical Imaging Systems			Z	Z,ZK	6
The course covers the princi	ples, design and properties of currently used medical imaging devices. We shall deal wi	th 2D microscopic	c, X-ray and	ultrasound	imaging syster	ns, including
advanced topics such as Do	ppler ultrasound. We will also study tomographic (3D) imaging systems: computed tomog	graphy (CT), mag	netic resona	ince imaging	g (MRI) includii	ng functional
MRI (fMRI) and nuclear ima	ging methods (PET,SPECT). For more information see https://cw.fel.cvut.cz/wiki/course	es/zsl				
Name of the bloc	k: Compulsory courses in the specialization					
Minimal number	of credits of the block: 30					
The role of the bl	ock: PS					
Code of the grou	p: 2018 MBIOPS4					
Name of the grou	 .p. Compulsory subjects of specialization					
Poquiromont cro	dits in the group: In this group you have to gain 30	crodite				
Requirement or	uits in the group. In this group you have to gain 50					
Requirement cou	inses in the group. In this group you have to comple	ele 5 cours	ses			
Credits in the gro	oup: 30					
Note on the grou	p:					
	Name of the course / Name of the group of courses					
Code	(in case of groups of courses the list of codes of their	Completion	Credits	Scope	Semester	Role
0000	members)	Completion	oreano	Coope	Comodici	Roio
	Iutors, authors and guarantors (gar.)					
BAM31ADA	Adaptive signal processing	Z,ZK	6	2P+2C	Z	PS
	Modeling and analysis of brain activity		-	00.00	_	
BAM31MOA	Jaroslav Hlinka Jaroslav Hlinka Jaroslav Hlinka (Gar.)	Z,ZK	6	2P+2C	Z	PS
BAM31NPG	Neurophysiology	Z,ZK	6	2P+2C	Z	PS
	r emysi Jiruska, reiena Pivo kova r emysi Jiruska r emysi Jiruska (Gar.)					
B2M31DSP	Pavel Sovka, Petr Pollák Pavel Sovka Pavel Sovka (Gar.)	Z,ZK	6	2P+2C	Z,L	PS
BAM317AS	Analog Signal Processing	7 7K	6	20121		
	Ji í Hospodka Ji í Hospodka Ji í Hospodka (Gar.)	۷.۷۲	0			гə

Characteristics of the courses of this group of Study Plan: Code=2018_MBIOPS4 Name=Compulsory subjects of specialization

BAM31ADA	Adaptive signal processing	Z,ZK	6	
This course provides a	basic discourse on adaptive algorithms for filtering, decorrelation, separation and beamforming.			
BAM31MOA	Modeling and analysis of brain activity	Z,ZK	6	
BAM31NPG	Neurophysiology	Z,ZK	6	
B2M31DSP	Advanced DSP methods	Z,ZK	6	
The course follows the basic course in signal processing and introduces advanced methods of analysis and digital signal processing. Graduates will learn the methods of digital signals				
analysis and be able to practically use them. They learn to know the conditions of use of correlation, spectral and coherent analysis of random signals. They will became familiar with				
methods of signal decomposition and independent component analysis and the time-frequency transformations. Emphasis will be placed on an ability to interpret the results of signal				
analyses.				
BAM31ZAS	Analog Signal Processing	Z,ZK	6	
The course deals with analog input-output blocks for signal transmission and processing. They discussed circuit solution of amplifiers and filters, including their design process, simulation				
and measurement. Students learn the circuit concepts and possibilities for solving the contemporary analogue structures. The second part of the course describes the design and				
implementation of analo	og filters, including discrete-time circuits. The conclusion is devoted to the possibilities of computer optimization of electronic (circuits and filters.		

Name of the block: Compulsory elective courses Minimal number of credits of the block: 24 The role of the block: PV

Code of the group: 2018_MBIOPPV4 Name of the group: Compulsory subjects of the programme Requirement credits in the group: In this group you have to gain 24 credits Requirement courses in the group: In this group you have to complete 4 courses Credits in the group: 24 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors, and quarantors (gar)	Completion	Credits	Scope	Semester	Role
	Experimental Data Analysis	7.7K	6	2P+2C	7	
BAM17EPM	Jan [°] Rusz Jan Rusz Jan Rusz (Gar.) Applications of Electromagnetic Fields in Medicine	7.7K	6	2P+2l		PV
BAM31AOI	Jan Vrba, Ladislav Oppl Jan Vrba Jan Vrba (Gar.) Applied optoelectronics in medicine	2,2K	6	2P+2I	-	 PV
	Jan Havlík Jan Havlík Jan Havlík (Gar.)	2,21			-	
BAM36BIN	Ji í Kléma Ji í Kléma Ji í Kléma (Gar.)	Z,ZK	6	2P+2C	L	PV
BAM02BIO	Biosensors Bohuslav Rezek Bohuslav Rezek Bohuslav Rezek (Gar.)	Z,ZK	6	2P+2L	Z	PV
BAM02FPT	Physics for Diagnostics and Therapy Vratislav Fabián, Jan Vrba, Ladislav Oppl Vratislav Fabián Vratislav Fabián (Gar.)	Z,ZK	6	2P+2L		PV
B0M37FAV	Physiology and modeling of hearing and vision Miloš Klíma, Václav Vencovský, Petr Maršálek, Karel Fliegel Karel Fliegel Václav Vencovský (Gar.)	Z,ZK	6	2P+2C+4C	z	PV
B4M35KO	Combinatorial Optimization Zden k Hanzálek Zden k Hanzálek Zden k Hanzálek (Gar.)	Z,ZK	6	3P+2C	L	PV
BAM38KLS	Construction of Medical Systems Jan Holub Jan Holub Jan Holub (Gar.)	Z,ZK	6	2P+2L	Z	PV
B4M33MPV	Computer Vision Methods Georgios Tolias, Ji í Matas, Jan ech, Dmytro Mishkin Ond ej Drbohlav Ji í Matas (Gar.)	Z,ZK	6	2P+2C	L	PV
B4M36MBG	Molecular Biology and Genetics Martin Pospíšek Martin Pospíšek (Gar.)	Z,ZK	6	3P+1C	L	PV
BAM33NIN	Neuroinformatics Giulia D'Angelo, Ji í Hammer, Daniel Novák, Eduard Bakštein, Karla Št pánová, Ján Antolík, David Kala Daniel Novák Daniel Novák (Gar.)	Z,ZK	6	2P+2C	L	PV
B4M33PAL	Advanced algorithms Marko Genyk-Berezovskyj, Daniel Pr ša, Ond ej Drbohlav Daniel Pr ša Daniel Pr ša (Gar.)	Z,ZK	6	2P+2C	Z	PV
BE4M33SSU	Statistical Machine Learning Jan Drchal, Vojt ch Franc Vojt ch Franc (Gar.)	Z,ZK	6	2P+2C	Z	PV
B4M36SMU	Symbolic Machine Learning Filip Železný, Ond ej Kuželka, Gustav Šír Ond ej Kuželka Ond ej Kuželka (Gar.)	Z,ZK	6	2P+2C	L	PV
BAM17EMC	Introduction to electromagnetic compatibility Tomáš Ko ínek Tomáš Ko ínek Tomáš Ko ínek (Gar.)	Z,ZK	6	2P+2L	Z	PV
BAM33ZMO	Medical Image Processing Jan Kybic, Oleksandr Shekhovtsov Jan Kybic Jan Kybic (Gar.)	Z,ZK	6	2P+2C	Z	PV
Characteristics of	the courses of this group of Study Plan: Code=2018 MBIOPPV4 I	Name=Comp	ulsorv sı	ubiects c	of the progr	ramme
B2M31AEDA	Experimental Data Analysis		, ,	7	Z,ZK	6
In the course of subject	Experimental Data Analysis", students will acquire knowledge regarding fundamental me	thods for data ana	alysis and m	achine lear	ning for evaluation	tion and
interpretation of data. In	the course of practical lectures, students will solve individual tasks using real data from sig	inal processing in	neuroscien	ce research	In the course	of semestral
students to use critical th	e complex task and present obtained results. The aim of the subject is to introduce practical tasks	al application of fu	Indamental	statistical m	ethods as well	as to teach
	Applications of Electromagnetic Fields in Medicine				7 7 1	6
The major aim of these le	ctures is to give to students a basic overview of biophysical aspects of EM fields in different	t biological system	ns including	an overviev	_,∠r v of microwave	applications
in medicine. Safety limits	, clinical usage of EM field effects on biological systems, microwave hyperthermia, measu	rement of dielecti	ric paramete	ers of biolog	ical tissues, EN	∕l exposure
of mobile phone users, n	nagnetic resonance imaging, interaction of optical radiation with biological tissue.					
BAM31AOL	Applied optoelectronics in medicine			Z	Z,ZK	6
BAM36BIN	Bioinformatics	Z,ZK 6			6	
BAM02BIO	Biosensors			Z	Z,ZK	6
BAM02FPT	Physics for Diagnostics and Therapy			Z	Z,ZK	6
In this course, students will be introduced to the problems of locomotive organs diseases and musculoskeletal pain in the first seven lectures. Great space is devoted to electrotherapeutic						
methods, therapeutic ultrasound and phototherapy. Furthermore, advanced neurorehabilitation methods, especially transcranial brain stimulation methods (repetitive transcranial						
magnetic stimulation of the brain - rTMS, transcranial electrical stimulation of the brain - tDCS and electroconvulsive therapy - ECT) are discussed. In the second half of the semester,						
attention is paid to the possibilities of using ionizing electromagnetic fields in medical diagnostics and therapy (eg X-ray, proton therapy, radiotherapy, etc.).						
	B0M37FAV Physiology and modeling of hearing and vision Z,ZK 6					
communication channels	ourse is to study the physiology of sensors and processes of perception of audio and visu	ai iniormation by l	numan subj	the field of b	uman vision o	ind bearing
physiology and at the sa	me time, presents their description using mathematical models using the latest computation	ional tools and pro	ocedures in	cluding May	chine Learning	(MI) Deen
Learning (DL) and Artific	ial Intelligence (AI). Emphasis is also placed on current and prospective applications of the	e mentioned know	ledge, The r	nain applica	tion area is the	audiovisual
technology related to hur	nan perception, but the direct employment of the acquired knowledge also includes the ar	eas of multimedia	technology,	control sys	tems, automati	on, robotics,
safety and security techr	ology, bioinspired systems, etc. At the same time, students gain a general overview of info	ormation processi	ing in biolog	ical systems	s. A separate p	art is the
objectification of audiovis	sual information perceived quality, i.e., Quality of Experience (QoE). The course is intende	d for students of r	naster's deg	gree in techr	nical fields. The	exercises
will be devoted to fundam	nental experiments to determine the most important characteristics of HAS and HVS, inclu-	uding computation	nal models a	and simulati	on of vision an	d hearing

processes.

B4M35KO	Combinatorial Optimization	7.7K	6	
The goal is to show the	problems and algorithms of combinatorial optimization (often called discrete optimization: there is a strong overlap with the ter	m operations rese	arch). Following	
the courses on linear al	gebra, graph theory, and basics of optimization, we show optimization techniques based on graphs, integer linear programmi	ng, heuristics, apr	proximation	
algorithms and state spa	ace search methods. We focus on application of optimization in stores, ground transportation, flight transportation, logistics, p	lanning of human	resources,	
scheduling in production	lines, message routing, scheduling in parallel computers.	Ū		
BAM38KLS	Construction of Medical Systems	Z,ZK	6	
B4M33MPV	Computer Vision Methods	Z,ZK	6	
The course covers select	cted computer vision problems: search for correspondences between images via interest point detection, description and ma	ching, image stite	hing, detection,	
recognition and segmer	tation of objects in images and videos, image retrieval from large databases and tracking of objects in video sequences. This	course is also pa	art of the	
inter-university program	me prg.ai Minor. It pools the best of AI education in Prague to provide students with a deeper and broader insight into the fiel	d of artificial intell	igence. More	
information is available	at https://prg.ai/minor.			
B4M36MBG	Molecular Biology and Genetics	Z,ZK	6	
BAM33NIN	Neuroinformatics	Z,ZK	6	
The Neuroinformatics C	ourse concentrates on modelling of neurons, stochastic learning on cellular level, information coding and decoding in brain and	single unit proce	ssing. Examples	
from clinical practices a	re provided throughout the course. The labs focus on signal neuron analysis from human and animal brain.			
B4M33PAL	Advanced algorithms	Z,ZK	6	
Basic graph algorithms	and graph representation. Combinatorial algorithms. Application of formal languages theory in computer science - pattern ma	tching.		
BE4M33SSU	Statistical Machine Learning	Z,ZK	6	
The aim of statistical ma	achine learning is to develop systems (models and algorithms) for learning to solve tasks given a set of examples and some	orior knowledge a	bout the task.	
This includes typical tas	ks in speech and image recognition. The course has the following two main objectives 1. to present fundamental learning cor	ncepts such as ris	k minimisation,	
maximum likelihood esti	mation and Bayesian learning including their theoretical aspects, 2. to consider important state-of-the-art models for classific	ation and regress	ion and to show	
how they can be learned	d by those concepts.			
B4M36SMU	Symbolic Machine Learning	Z,ZK	6	
This course consists of	four parts. The first part of the course will explain methods through which an intelligent agent can learn by interacting with its	environment, also	known as	
reinforcement learning. This will include deep reinforcement learning. The second part focuses on Bayesian networks, specifically methods for inference. The third part will cover				
fundamental topics from	natural language learning, starting from the basics and ending with state-of-the-art architectures such as transformer. Finally	y, the last part will	provide an	
introduction to several to	ppics from the computational learning theory, including the online and batch learning settings.			
BAM17EMC	Introduction to electromagnetic compatibility	Z,ZK	6	
The subject dwells on p	roblems of electromagnetic compatibility. Students obtain the basic knowledges in the field of electromagnetic compatibility -	electromagnetic i	nterference,	
susceptibility and testing methods. The subject leads to gain professional skills in the field of electrical engineering.				
BAM33ZMO	Medical Image Processing	Z,ZK	6	
This course covers the	nost used advanced image analysis methods, with emphasis on images from medical and biological modalities, from microsi	copy, to ultrasoun	d, MRI, or CT,	
including time sequence	9S.			

Name of the block: Elective courses Minimal number of credits of the block: 0 The role of the block: V

Code of the group: 2018_MBIOH Name of the group: Humanities subjects Requirement credits in the group: Requirement courses in the group: Credits in the group: 0 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
B0M16FIL	Peter Zamarovský Peter Zamarovský Peter Zamarovský (Gar.)	Z,ZK	5	2P+2S	Z,L	V
B0M16HVT	History of science and technology 2 Marcela Efmertová, Jan Mikeš Marcela Efmertová Marcela Efmertová (Gar.)	Z,ZK	5	2P+2S	Z,L	V
B0M16HSD1	History of economy and social studies Marcela Efmertová	Z,ZK	5	2P+2S	Z,L	V
B0M16PSM	Psychology Jan Fiala Jan Fiala Jan Fiala (Gar.)	Z,ZK	5	2P+2S	Z,L	V
A003TV	Physical Education Ji í Drnek	Z	2	0+2	L,Z	V
B0M16TEO	Theology Vladimír Sláme ka Vladimír Sláme ka Vladimír Sláme ka (Gar.)	Z,ZK	5	2P+2S	Z,L	V

Characteristics of the courses of this group of Study Plan: Code=2018_MBIOH Name=Humanities subjects

B0M16FIL		Z,ZK	5
B0M16HVT	History of science and technology 2	Z,ZK	5
This subject traces histo	prical developments in electrical engineering branches in the world and in the Czech Lands. Its ultimate goal is to stimulate si	udents' interest in	the history and
traditions of the subject,	while highlighting the developments in technical education and professional organizations, the process of shaping scientific	life and the influe	nce of technical
engineers			
B0M16HSD1	History of economy and social studies	Z,ZK	5
This subject deals with the history of the Czech society in the 19th - 21th centuries. It follows the forming of the Czech political representation, its aims and achieved results as well as			
the social and cultural development and coexistence of the various ethnical groups in the Czech countries.			

B0M16PSM	Psychology	Z,ZK	5	
A003TV	Physical Education	Z	2	
B0M16TEO	Theology	Z,ZK	5	
This subject provides to students the basic orientation in christian theology and requires no special previous education. After short philosophic lecture the basic theologic disciplines				
are gone through. The subject is determined not only to believer students who want to know the reliable theologic grounding but also above all to ones who want to get know Christianity				

- religion from which graws our civilization up.

Code of the group: 2018_MBIOVOL Name of the group: Elective subjects Requirement credits in the group: Requirement courses in the group: Credits in the group: 0 Note on the group: ~Nabídk

~Nabídku volitelných předmětů uspořádaných podle kateder najdete na webových stránkách http://www.fel.cvut.cz/cz/education/volitelne-predmety.html\\

List of courses of this pass:

A003TV Physical Education Z 2 BOM16FLL Z,ZK 5 BOM16FLD Z,ZK 5 BOM16FLD Z,ZK 5 BOM16FLD Exote society in the 19th - 21th certures. It follows the forming of the Czech policical representation, its aims and achieved results as well as the social and cultral development and coexistence of the various ethnical groups in the Czech countries. 5 BOM16FLD History of science and technology 2 Z,ZK 5 This subject values historical developments in technical ductation and professional organizations, the process of shaping scientific life and the influence of technical engineers 5 BOM16FED Theology Z,ZK 5 BOM16FTEO Theology Z,ZK 5 BOM37FAV Physiology and modeling of hearing and vision Z,ZK 6 BOM37FAV Physiology and modeling of hearing and vision Z,ZK 6 The prival of the curves is to study the physiology of sensors and processes of process summarizes current knowledge. The field of human' vision and hearing physiology and modeling of hearing and vision Z,ZK 6 BOM37FAV Physiology and modeling of hearing and vision Z,ZK 6				
BOM16FIL Z.ZK 5 BOM16HSD1 History of economy and social studies Z.ZK 5 BOM16HSD1 History of the Czech society in the 19th - 21th centuries. It follows the forming of the Czech political representation, its aims and achieved results as well as the social and cultural development and coexistence of the various ethinical propus in the Czech countries. 5 BOM16HVT History of Science and technology 2 Z.ZK 5 This subject traces historical developments in electrical engineering branches in the world and in the Czech Lands. Its ultimate goal is to stimulate students' interest in the history and traditions of the subject, while highlighting the developments in technical education and professional organizations, the process of shaping scientific file and the influence of technical engineers BOM16FEO Theology Z,ZK 5 BOM16FEO Theology Z,ZK 5 BOM37FAV Physiology and modeling of hearing and vision Z,ZK 6 The primary aim of the course is to study the physiology of sensors and processes of perception of auxialitement to the subject is determined not only to believer students want to know the reliable fibriolization up. Edigo from this grave cource students the basic theologic discipling to students the basic theologic discipling to students the description using and traine grave cource students the description cource and percestop and distan drivarial and most imoportant communication chan				
BOM16HSD1 History of economy and social studies Z,ZK 5 This subject deals with the history of the Czech society in the 19th - 21th centures. It follows the forming of the Czech political representation, its ams and achieved results as well as the social and cultural development and ceckitence of the various ethnical groups in the Czech contries. Z,ZK 5 BOM16HVT History of science and technology 2 Z,ZK 5 BOM16PSM Psychology Z,ZK 5 BOM16PSM Psychology Z,ZK 5 BOM16PSM Psychology Z,ZK 5 BOM16PSM Psychology Z,ZK 5 BOM16FEO Theology Z,ZK 5 BOM16FEO Theology Z,ZK 5 BOM16FEO Theology Z,ZK 6 This subject raceids to students the basic orientation in christian theologic grounding but also above all to ones who want to get know Christianly - religion from which graws our civilization up. Z,ZK 6 BOM16FEO Theology Z,ZK 6 BOM37FAV Physiology of sensors and procease is opecial previous education of value and vision on the stimule of value andin wision and procearies, including Machine Learning (ML				
This subject deals with the history of the Czech society in the 19th - 21th centuries. It follows the forming of the Czech political representation, its aims and achieved results as well as the social and cultural development and coexistence of the various ethnical groups in the Czech countries. BOM16HVT Listory of science and technology 2 Z,ZK 5 This subject traces historical developments in electrical engineering branches in the world and in the Czech Lands. Its ultimate goal is to stimulate students' interest in the history and regulation of the subject while highlighting the developments in technolog and professional organizations, the process of shaping scientific life and the influence of technical engineers BOM16PSM Psychology Z,ZK 5 BOM16PSM Psychology Z,ZK 5 This subject provides to students the basic orientation in christian theology and requires no special previous education. After short philosophic lecture the basic theologic disciplines are gone through. The subject is determined not only to believer students the want to know the reliable theologic grounding but also above all to ones who want to get know Christianly -religion from which graws our civilization up. EQXK 6 BOM37FAV Physiology of sensors and processes of perception of subica and sizual information by human subjects as two earth and most important communication channels, i.e., Human Auditory System (HAS) and Human Visual System (HVS). The course summarizes current knowledge in the field of human vision and hearing processing in the scient inter, presens their (HAS). The audit scient and subicit sinulation dy Mathine Learning (UL). Deep				
the social and cultural development and coexistence of the various ethnical groups in the Czech countries. BOM16HVT History of science and technology 2 Z,ZK 5 This subject traces historical developments in electrical engineering branches in the world and in the Czech Lands. Its utlimate goal is to stimulate students' interest in the history and traditions of the subject, while highlighting the developments in technical education and professional organizations, the process of shaping scientific life and the influence of technical engineers BOM16PSM Psychology Z,ZK 5 This subject traces historical developments in technical education and professional organizations, the process of shaping scientific life and the influence of technical engineers 5 BOM16FEO Theology Z,ZK 5 BOM37FAV Physiology of sensors and processes of perception of sucial and visual information by human subjects as two central and most important on chameks i, et., Human Auditory System (HAS) and Human Visual System (HVS). The course summarizes current knowledge in the field of human processes of perception of aucia and visual information by human subjects as two central and most important on physiology and modeling of hearing and vision Z,ZK 6 BOM37FAV Physiology and modeling of hearing and vision Z,ZK 6 The primary aim of the course is to study the physiology of sensors and processes of perception of taudia and human kines to stame the engineers Senset and most important income kines and basin				
BOM16HVT History of science and technology 2 Z,Zk 5 This subject traces historical developments in electical engineering branches in the world and in the Czech Lands. Its ultimate goal is to stimulate students' interest in the history and traditions of the subject, while highlighting the developments in technical education and professional organizations, the process of shaping scientific life and the influence of technical engineers BOM16PSM Psychology Z,ZK 5 BOM16PSM Z,ZK 5 This subject provides to students the basic orientation in christian theology and requires no special previous education. After short philosophic lecture the basic theologic disciplines are gone through. The subject is determined not only to believer students who want to know there liable theologic grounding but also above all to ones who want to get know Christian theology and modeling of hearing and Vision Z,ZK 6 BOM37FAV Physiology and modeling of hearing and Vision Z,ZK 6 Beprimary aim of the course is to study the physiolog of sensors of a processes of perception tenioned knowledge. The main application are is the audiovisual technology related to human processes of parception tenioned knowledge. The main application ares is the audiovisual inform				
This subject traces historical developments in electrical engineering branches in the world and in the Czech Lads. Its ultimate goal is to stimulate students' interest in the history and traditions of the subject, while highlighting the developments in technical education and professional organizations, the process of shaping scientific life and the influence of technical engineers BOM16PSM PsycholOgy Z,ZK 5 BOM16TEO Theology Z,ZK 5 This subject provides to students the basic orientation in christian theology and requires no special previous education. After short philosophic lecture the basic theologic disciplines are gone through. The subject is determined not only to believer students who want to know the reliable theologic grounding but also above all to ones who want to get know Christianity - religion from which graves our civilization up. C////> C////> C////> C//// C///// C//// C///// C//				
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information is available at https://pro.ai/minor				
R4M33PAI Advanced algorithms 7.7K 6				
Basic graph algorithms and graph representation. Combinatorial algorithms. Application of formal languages theory in computer science - pattern matching.				
B4M35KO Combinatorial Optimization 7 7K 6				
The goal is to show the problems and algorithms of combinatorial optimization (often called discrete optimization: there is a strong overlap with the term operations research). Following				
the courses on linear algebra, graph theory, and basics of optimization, we show optimization techniques based on graphs, integer linear programming, heuristics, approximation				
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algorithms and state space search methods. We focus on application of optimization in stores, ground transportation, flight transportation, logistics, planning of human resources.				

B4M36MBG	Molecular Biology and Genetics	Z,ZK	6	
B4M36SAN	Statistical Data Analysis	Z,ZK	6	
This course builds c	on the skills developed in introductory statistics courses. It is practically oriented and gives an introduction to applied statistics. It mainly	aims at multivaria	te statistical	
analysis and model	ling, i.e., the methods that help to understand, interpret, visualize and model potentially high-dimensional data. It can be seen as a p machine learning and data mining courses.	urely statistical co	unterpart to	
B4M36SMU	Symbolic Machine Learning	Z.ZK	6	
This course cons	ists of four parts. The first part of the course will explain methods through which an intelligent agent can learn by interacting with its	environment, also l	known as	
reinforcement lea	arning. This will include deep reinforcement learning. The second part focuses on Bayesian networks, specifically methods for inferen	ice. The third part	will cover	
fundamental topic	s from natural language learning, starting from the basics and ending with state-of-the-art architectures such as transformer. Finally, introduction to several topics from the computational learning theory, including the online and batch learning settings.	, the last part will p	rovide an	
BAM02BIO	Biosensors	Z,ZK	6	
BAM02FPT	Physics for Diagnostics and Therapy	Z,ZK	6	
In this course, stude	ints will be introduced to the problems of locomotive organs diseases and musculoskeletal pain in the first seven lectures. Great space is	s devoted to electro	otherapeutic	
methods, therape	eutic ultrasound and phototherapy. Furthermore, advanced neurorehabilitation methods, especially transcranial brain stimulation methods	hods (repetitive tra	nscranial	
magnetic stimulatio	n of the brain - rTMS, transcranial electrical stimulation of the brain - tDCS and electroconvulsive therapy - ECT) are discussed. In the	e second half of th	e semester,	
	ion is paid to the possibilities of using ionizing electromagnetic fields in medical diagnostics and therapy (eg X-ray, proton therapy, ra	diotherapy, etc.).	0	
BAM17EMC	INTRODUCTION TO Electromagnetic compatibility	Z,ZK	b	
The subject twen	s on problems of electromagnetic compatibility. Students obtain the basic knowledges in the field of electromagnetic compatibility and testing methods. The subject leads to gain professional skills in the field of electrical engineering	lectromagnetic inte	filerence,	
BAM17EPM	Applications of Electromagnetic Fields in Medicine	7 7K	6	
The major aim of the	ese lectures is to give to students a basic overview of biophysical aspects of EM fields in different biological systems, including an overv	/iew of microwave	applications	
in medicine. Safety	limits, clinical usage of EM field effects on biological systems, microwave hyperthermia, measurement of dielectric parameters of bio	ological tissues, EN	/ exposure	
	of mobile phone users, magnetic resonance imaging, interaction of optical radiation with biological tissue.			
BAM31ADA	Adaptive signal processing	Z,ZK	6	
	This course provides a basic discourse on adaptive algorithms for filtering, decorrelation, separation and beamforming.			
BAM31AOL	Applied optoelectronics in medicine	Z,ZK	6	
BAM31BSG	Biological signals	Z,ZK	6	
BAM31LET	Medical Instrumentation and Devices	Z,ZK	6	
Students will study t	fundamental principles applied within the modern medical devices and systems, esp. from the point of view of functional blocks and ele	ectronic circuits of	diagnostical	
and therapeutica	I medical equipments including electrocardiographs, electroencephalographs, bedside and central monitors, equipments for anestes	iology, intensive ar	nd critical	
DAM24MQA	tients for clinical laboratory, electrostimulators, cardiostimulators and delibrilators, blood pressure and how measurement (including i	and pulse	oxymetry.	
BAMISTINIOA	Modeling and analysis of brain activity	Z,ZK	6	
BAM31NPG	Neurophysiology	Z,ZK	6	
BAM31ZAS	Analog Signal Processing		6 simulation	
and measuremen	In analog input-output blocks for signal transmission and processing. They discussed circuit solution of amplifiers and niters, including it to students learn the circuit concents and notes including it to students learn the circuit concents and notes including it to students learn the circuit concents and notes including it to students learn the circuit concents and notes including it to students learn the circuit concents and notes including it to students learn the circuit concents and notes including it to students learn the circuit concents and notes including it to students learn the circuit concents and notes including it to students learn the circuit concents and notes including it to students le	se describes the d	s, simulation	
implementa	tion of analog filters, including discrete-time circuits. The conclusion is devoted to the possibilities of computer optimization of electro	nic circuits and filt	ers.	
BAM33NIN	Neuroinformatics	Z.ZK	6	
The Neuroinformati	cs Course concentrates on modelling of neurons, stochastic learning on cellular level, information coding and decoding in brain and sir	igle unit processing	. Examples	
	from clinical practices are provided throughout the course. The labs focus on signal neuron analysis from human and animal b	rain.		
BAM33ZMO	Medical Image Processing	Z,ZK	6	
This course covers	the most used advanced image analysis methods, with emphasis on images from medical and biological modalities, from microsco	py, to ultrasound, N	/IRI, or CT,	
D 4 4 4 6 D 4	including time sequences.			
BAM33ZSL	Medical Imaging Systems	Z,ZK	6	
advanced topics su	ne principies, design and properties of currently used medical imaging devices, we shall deal with 2D microscopic, X-ray and ultrasou thas Doppler ultrasound. We will also study tomographic (3D) imaging systems: computed tomography (CT), magnetic resonance imaging devices.	na imaging system	a functional	
advanced topics su	MRI (fMRI) and nuclear imaging methods (PET.SPECT). For more information see https://cw.fel.cvut.cz/wiki/courses/zsl	ging (Mixi) includin	grunetional	
BAM36BIN	Bioinformatics	7.7K	6	
BAM38KLS	Construction of Medical Systems	7.7K	6	
BDIP30	Diploma Thesis	7	30	
Independent final of	comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or h	er branch of study	, which will	
be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.				
BE4M33SSU	Statistical Machine Learning	Z,ZK	6	
The aim of statistic	cal machine learning is to develop systems (models and algorithms) for learning to solve tasks given a set of examples and some pri	or knowledge abou	it the task.	
This includes typica	al tasks in speech and image recognition. The course has the following two main objectives 1. to present fundamental learning conce	pts such as risk m	inimisation,	
maximum likelihood	I estimation and Bayesian learning including their theoretical aspects, 2. to consider important state-of-the-art models for classification how they can be learned by those concepts.	n and regression a	and to show	
BMPROJ6	Diploma Project	Z	6	
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For updated information see <u>http://bilakniha.cvut.cz/en/f3.html</u> Generated: day 2025-06-02, time 21:07.